

CLAIMS:

1. A method comprising:

modulating access channel information onto at least one set of time-continuous signal components of a communication signal, each set of time-continuous signal components having a respective common frequency, the communication signal comprising a plurality of signal components; and

transmitting the communication signal.

2. The method of claim 1, wherein the access channel information comprises a common synchronization code.

3. The method of claim 2, wherein the common synchronization code comprises a complex PN (pseudo noise) sequence associated with a plurality of transceiver stations in a communication network and known to communication terminals configured for accessing the communication network.

4. The method of claim 3, wherein the access channel information further comprises a cell-specific synchronization code uniquely associated with one of the plurality of transceiver stations.

5. The method of claim 4, wherein the at least one set of time-continuous signal components comprises a first set of time-continuous signal components having a first common frequency and a second set of time-continuous signal components

having a second common frequency, and wherein modulating comprises modulating the common synchronization code and the cell-specific synchronization code to both the first set of time-continuous signal components and the second set of time-continuous signal components.

6. The method of claim 1, wherein the communication signal further comprises a scattered pilot channel, and wherein modulating comprises modulating a first portion of the access channel information to the at least one set of time-continuous signal components and modulating a second portion of the access channel information to both the at least one set of time-continuous signal components and the scattered pilot channel.

7. The method of claim 1, wherein the communication signal comprises a plurality of sets of time-continuous signal components associated with respective frequency indexes, and wherein the frequency indexes of sets of time-continuous signal components onto which access channel information is modulated are separated by a power of 2.

8. The method of claim 1, wherein the communication signal is an OFDM (Orthogonal Frequency Division Multiplexing) signal, and wherein each of the at least one set of time-continuous signal components comprises signal components carried by a respective sub-carrier in a plurality of OFDM symbols.

9. The method of claim 6, wherein the communication signal is an OFDM (Orthogonal Frequency Division Multiplexing) signal, and wherein the scattered pilot channel is pair-wise scattered onto sub-carriers having a common sub-carrier index
5 in pairs of consecutive OFDM symbols.

10. The method of claim 1, wherein the access channel information comprises a 3GPP (3rd Generation Partnership Project) PSC (Primary Synchronization Code), a 3GPP SSC
10 (Secondary Synchronization Code) sequence, and a 3GPP primary scrambling code.

11. The method of claim 1, wherein transmitting comprises transmitting the communication signal via a plurality of
15 antennas.

12. A method of accessing a communication network comprising:

receiving a communication signal having a plurality
20 of sets of time-continuous signal components;

searching for access channel information in at least one predetermined set of the plurality of sets of time-continuous signal components; and

determining synchronization parameters based on a
25 location of the access channel information in the at least one predetermined set of time-continuous signal components.

13. The method of claim 12, wherein searching comprises searching for a common synchronization code associated with a plurality of base transceiver stations in the communication network and searching for any of a plurality of cell-specific synchronization codes respectively uniquely associated with the plurality of base transceiver stations.

14. The method of claim 13, wherein searching for the common synchronization code comprises:

10 sampling the received communication signal;

performing a time domain to frequency domain transformation using a transformation window starting at a start position to generate a frequency domain signal;

15 extracting frequency domain data corresponding to the at least one predetermined set of time-continuous signal components from the frequency domain signal within a window having a length of a predetermined period;

correlating the extracted data with the common synchronization code;

20 moving the predetermined period-length window by a predetermined step size until a starting position of the predetermined period-length window has been moved a distance of at least the predetermined period;

25 repeating the extracting and correlating for each position of the predetermined period-length window; and

determining peak correlation values indicating occurrences of the common synchronization code.

15. The method of claim 14, wherein the communication signal comprises a plurality of frames, each frame comprising a plurality of symbols, wherein the predetermined period is a length of each of the frames, and wherein the step size is a
5 length of each of the symbols.

16. The method of claim 15, wherein determining synchronization parameters comprises determining candidate first symbols of the plurality of frames corresponding to the
10 peak correlation values.

17. The method of claim 16, wherein the peak correlation values comprise a predetermined number of maximum correlation values.

15

18. The method of claim 16, wherein the peak correlation values comprise correlation values above a predetermined threshold.

20 19. The method of claim 16, further comprising:

generating a coarse timing position estimate,

wherein the transformation window start position is the initial timing position estimate.

25 20. The method of claim 19, wherein the communication signal further comprises a cyclic prefix, and wherein

generating a coarse timing position estimate comprises estimating timing position based on the cyclic prefix.

21. The method of claim 15, further comprising:

5 moving the transformation window by a transformation window step size until a starting position of the transformation window has been moved a distance of at least the symbol length; and

10 for each position of the transformation window, repeating the performing, extracting, correlating, moving the predetermined period-length window, repeating the extracting and correlating, and determining peak correlation values.

22. The method of claim 21, wherein determining
15 synchronization parameters comprises:

determining candidate first symbols of the plurality of frames corresponding to the peak correlation values; and

determining candidate coarse timing position estimates corresponding to respective transformation window
20 start positions from which frequency domain signals associated with the peak correlation values were generated.

23. The method of claim 22, wherein the transformation window step size is one sample of the received communication
25 signal.

24. The method of claim 22, wherein the transformation window step size is N samples of the received communication signal, N an integer, and wherein determining candidate coarse timing position estimates comprises searching transformation
5 window positions corresponding to the maximums of each correlation peak using a transformation window step size less than N.

25. The method of claim 24, wherein the communication
10 signal further comprises a cyclic prefix, and wherein N corresponds a length of the cyclic prefix.

26. The method of claim 19, wherein searching for any of the plurality of cell-specific synchronization codes comprises,
15 for each of the candidate first symbols:

performing the time domain to frequency domain transformation using the coarse timing position estimate as the transformation start window position;

extracting frequency domain data corresponding to the
20 at least one predetermined set of time-continuous signal components from the frequency domain signal;

correlating the extracted data with each of the cell-specific synchronization codes; and

determining peak correlation values indicating
25 occurrences of one of the cell-specific synchronization codes.

27. The method of claim 26, further comprising:

identifying the base transceiver station associated with each of the cell-specific synchronization codes corresponding to the peak correlation values.

5 28. The method of claim 19, wherein searching for the common synchronization code further comprises storing the frequency domain signal to memory, and wherein searching for any of the plurality of cell-specific synchronization codes comprises, for each of the candidate first symbols:

10 retrieving the frequency domain signal from the memory;

extracting frequency domain data corresponding to the at least one predetermined set of time-continuous signal components from the frequency domain signal;

15 correlating the extracted data with each of the cell-specific synchronization codes; and

determining peak correlation values indicating occurrences of one of the cell-specific synchronization codes.

20 29. The method of claim 22, wherein searching for any of the plurality of cell-specific synchronization codes comprises, for each pair of one of the candidate first symbols and its corresponding coarse timing position estimate:

performing the time domain to frequency domain
25 transformation using the coarse timing position estimate as the transformation start window position;

extracting frequency domain data corresponding to the at least one predetermined set of time-continuous signal components from the frequency domain signal;

correlating the extracted data with each of the cell-specific synchronization codes; and

determining peak correlation values indicating occurrences of one of the cell-specific synchronization codes.

30. The method of claim 29, further comprising:

10 identifying the base transceiver station associated with cell-specific synchronization codes corresponding to the peak correlation values.

31. The method of claim 12, wherein the communication signal is an OFDM (Orthogonal Frequency Division Multiplexing) signal, and wherein each of the predetermined sets of time-continuous signal components comprises signal components carried by a respective sub-carrier in a plurality of OFDM symbols.

20

32. The method of claim 12, wherein receiving comprises receiving communication signals from a plurality of transmitting antennas via at least one receiving antenna.

25 33. A computer-readable medium storing instruction which, when executed by a processor, perform the method of claim 12.

34. A method comprising:

modulating a cell-specific synchronization code uniquely associated with one of a plurality of base transceiver stations in a communication network onto a scattered pilot channel carried by predetermined pilot channel sub-carriers of a communication signal; and

transmitting the communication signal.

35. The method of claim 34, further comprising:

receiving the communication signal at a communication terminal;

extracting data from the scattered pilot channel;

searching for the cell-specific synchronization code in the data extracted from the scattered pilot channel; and

performing fine timing and frequency synchronization operations at the communication terminal when the cell-specific synchronization code is found in the data extracted from the scattered pilot channel.

36. The method of claim 34, wherein the communication signal further comprises a plurality of sets of time-continuous signal components carried by respective ones of a plurality of sub-carriers, and wherein modulating comprises modulating the common synchronization code and the cell-specific synchronization code onto at least one of the plurality of sets of time-continuous signal components.

37. The method of claim 36, wherein the common synchronization code comprises a primary synchronization code (PSC) and a secondary synchronization code (SSC), and the cell-specific synchronization code comprises a scrambling code.

5

38. The method of claim 37, wherein the PSC, the SSC and a first portion of the scrambling code are mapped to an initial access channel comprising the at least one of the plurality of sets of time-continuous signal components, and a second portion
10 of the scrambling code is mapped to the scattered pilot channel.

39. The method of claim 37, wherein the PSC is mapped to an initial access channel comprising the at least one of the
15 plurality of sets of time-continuous signal components, and the SSC and the scrambling code are mapped onto the scattered pilot channel.

40. A physical layer structure for communication signals
20 comprising:

a plurality of symbols, each symbol comprising a plurality of signal components carried by a respective plurality of sub-carriers; and

an initial access channel for carrying a
25 synchronization code for use in synchronization operations at a communication terminal, the initial access channel being mapped to a time-continuous set of the signal components, the time-continuous set of signal components comprising signal

components from the plurality of the symbols carried by at least one of the plurality of sub-carriers.

41. The physical layer structure of claim 40, further
5 comprising a scattered pilot channel mapped to a common sub-carrier in pairs of consecutive symbols.

42. The physical layer structure of claim 40, wherein the
communication signals are OFDM (Orthogonal Frequency Division
10 Multiplexing) signals.

43. A base transceiver station in a communication
network, comprising:

a processor configured to map a synchronization
15 channel to a set of time-continuous signal components in a
communication signal; and

an output configured to transmit the communication
signal.

20 44. The base transceiver station of claim 43, wherein the
output is configured to be connected to a plurality of
antennas.

45. A communication terminal comprising:

an input configured to receive a communication signal having a plurality of signal components carried by respective sub-carriers; and

5 a processor configured to search for synchronization channel information in predetermined time-continuous sets of the signal components carried by respective ones of the plurality of sub-carriers and to determine synchronization parameters based on a location of the synchronization channel information in the predetermined time-continuous sets of the
10 signal components.

46. The communication terminal of claim 45, further comprising:

15 a memory for storing the synchronization channel information,

wherein the processor is further configured to retrieve the synchronization channel information from the memory.

20 47. A communication network comprising a plurality of base transceiver stations comprising:

means for modulating access channel information onto at least one set of time-continuous signal components of a communication signal, each set of time-continuous signal
25 components having a respective common frequency, the communication signal comprising a plurality of signal components; and

means for transmitting the communication signal to a plurality of communication terminals configured for operation

in the communication network, each communication terminal comprising:

means for receiving a communication signal having a plurality of sets of time-continuous signal components;

means for searching for the access channel information in the plurality of sets of time-continuous signal components; and

means for determining synchronization parameters based on a location of the access channel information in the plurality of sets of time-continuous signal components.